DRIVER

FEBRUARY 1986

HOW'S YOUR ELBOW ROOM?

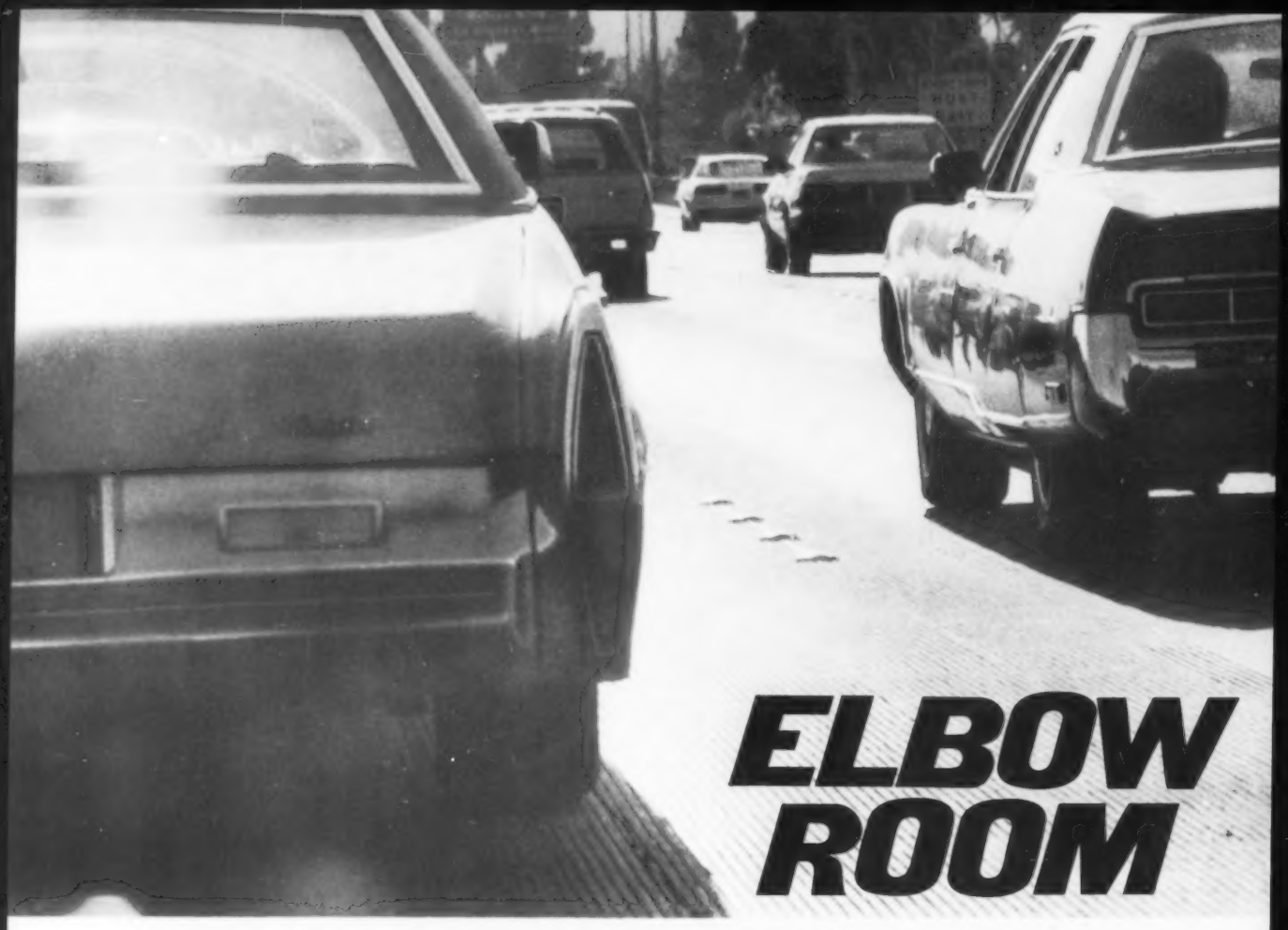
page one

ALL about ye olde Brake Jobs

see page 20

WHAT DOES YOUR OL' BUGGY SAY ABOUT YOU?

see page 14



ELBOW ROOM

Providing ourselves with a little extra space is important for avoiding hazards and relieving tension.

When we talk about wanting to avoid something unpleasant or dangerous, we speak of keeping things "at arm's length," or of giving ourselves some "elbow room." When we drive we use other terms, for instance "providing a space 'cushion,'" but it's all the same idea. We need extra space around the car while driving to keep us safe.

The "cushion of space" idea is a good one. The clear space in front, to the sides and behind our cars will "absorb" the intrusion of another car. It gives us the time and the room to move out of the way.

Making sure we have room when we drive is what this article is all about. We can plan to give ourselves that space, and we can control it (to some degree) by speed and maneuvering.

But first, we have to know what our needs are. How much space is enough to the front of the car? To the sides?

FOLLOW THE LEADER

The room you need to the front depends on several considerations. The first is your following distance. You must maintain enough space between yourself and the vehicle ahead so that you can stop safely. Experts used to talk about maintaining "one car length for each 10 miles per hour of speed." The trick was, how does one judge that space?

An easier method is to keep two seconds-worth of space ahead of you. This means, leave clear space ahead of you equal to the distance your car travels in two seconds. This is adequate space, and it is easy to measure. Simply allow the car ahead to pass a stationary object, a tree or a crack in the pavement, for instance. Then count off two seconds ("One-thousand-and-one, one-thousand-and-two."). You should reach that same object two seconds after the other car. This is not only simple, it also works no matter what speed you happen to be moving.

An important thing is not to allow another motorist to set the pace for you. If you follow too closely, you will have to spend a lot of time adjusting for changes in his/her speed. Instead, if he/she goes too fast, let him/her pull away while you maintain the speed limit. If he/she moves too slowly, go around and maintain a steady pace. We'll get back to speed adjustments later.

SECONDS LATER . . .

Besides the "two-second rule" men-

(top right)
In the middle of the herd, do everything you can to provide yourself with some space to maneuver.

(below right)
Stay at least two seconds behind any car you follow, so you'll have enough elbow room to stop in event of trouble. Here, if the first car did something unexpected, the second car would be out of luck.

tioned above, there are two other considerations for the space ahead. One could be called a "four-second stopping distance." Your car can stop within the distance it travels in four seconds, again regardless of your speed. Therefore, you need to watch for hazards you will encounter within that four-second period.

The other is what could be called a "twelve-second zone." This, the distance the car travels in 12 seconds, is the space you should scan ahead of you. By looking this far ahead you will have enough time to see and react to hazards ahead of you before you reach the four-second stopping zone.

Remember, there is a time lag in your response to a hazard, about three-quarters of a second or more, which includes time for your eyes to *see* a hazard, for your brain to *recognize* it as a hazard and to decide on appropriate action. Then, you have to perform the action — a turn, a stop, or whatever. Looking 12 seconds ahead will help.

SPACE TRACKING

How about the space behind you? Obviously, you can't control what the car in back of you is doing, so if it gets too close you just have to get out of the way and let it go. That's safer than letting it ride on your rear bumper.

And how much space is enough to the sides? The American Automobile Association (AAA) says that you must allow enough room so that errors in judgment (by yourself or others) will not lead to accidents, and you must give yourself an escape route, a way out in case of danger. They recommend that you have at least a car width of space to one side, and preferably six to eight feet of room on both sides of the car.

Although you can't control where others place their cars in relation to yours, you can maintain adequate space by "tracking" your car down the center of the lane you travel in. To do this, re-

continued

THE TRAFFIC SAFETY MAGAZINE FOR THE MILITARY DRIVER

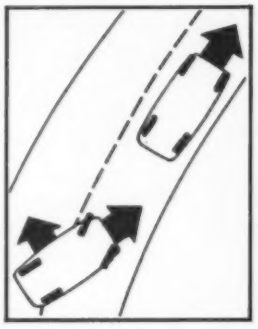
FEBRUARY 1986

DRIVER

Elbow Room 1

Skidding Control 5

Delivering Good Brakes 20



Backward Mechanic 8

Driving At Mather 10

Timely Topics 12

True Accidents 13

What Does Your Car Say About You? 14

Do Motorcycle Safety Foundation Programs Work? 16

Crossing Railroads 19

Backfire 28

In The Key Of 'B' Back Cover

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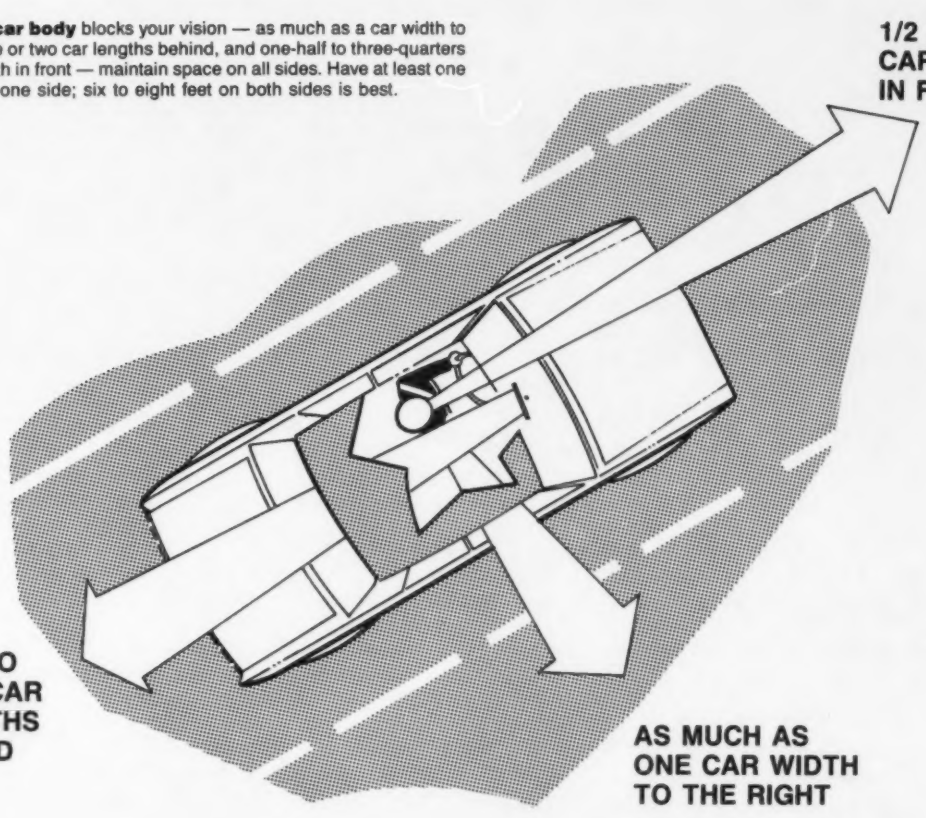
Since the car body blocks your vision — as much as a car width to the right, one or two car lengths behind, and one-half to three-quarters of a car length in front — maintain space on all sides. Have at least one car width to one side; six to eight feet on both sides is best.



member to sight along an imaginary line at the center of the lane well ahead of you. Steer toward that and you will be driving down the center of the lane.

Inexperienced drivers track by watching the car's fenders or the center of the leading edge of the hood. Many drivers track by gauging the space relationship of their car to the centerline or the right edge of the road. Both groups tend to aim their sight too low, and consequently they steer farther toward one side of the lane or the other.

Of course, there are times when the center of the lane will not give you the space you want. When another motorist drives by crowding the line, you might feel more comfortable a little farther away. If he/she gets too close, you might be unsure of his/her intentions — he/she might be preparing to move over into your lane. In such cases, it might be good to speed up to get out of his/her way. We'll talk later about using speed to control space.

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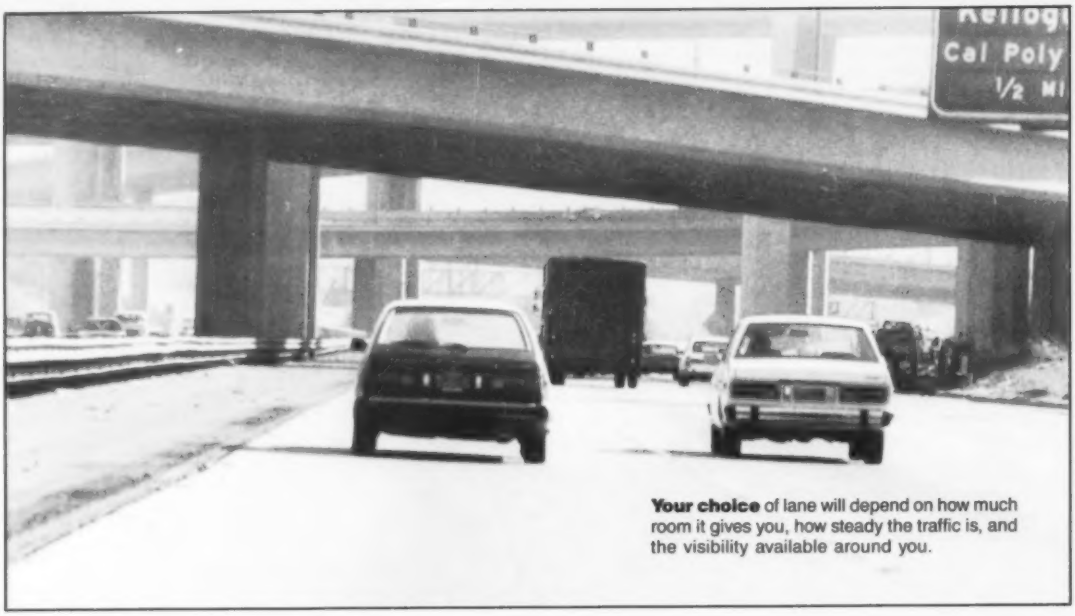


Your choice of lane will depend on how much room it gives you, how steady the traffic is, and the visibility available around you.

NERVOUS FITS

We have talked a lot about the safety side of having "elbow room." But the amount of free space we have around us will also affect how calm we are. Psychologists talk about the amount of space we must have around us in order to feel comfortable. If a stranger comes closer than a certain distance, and we do not want him or her there, we become nervous and perhaps hostile.

This idea applies in person-to-person confrontations, and it applies when the people are in cars.

Julius Fast, in his book *Body Language*, suggests that the idea of allowing space around ourselves — in or out of the car — is important to keeping us calm.

"We know that tailgating a car is dangerous from a purely physical point of view. If the car ahead stops short we can smack into it, but no one talks about what the act of tailgating can do to the nerves of the driver ahead . . .

"We have all been annoyed by drivers who cut in front of us, and we all know the completely irrational rage that can sometimes fill the driver who has thus had his space invaded. The police will cite statistics to show that dozens of accidents are caused by this cutting in, by the dangerous reaction of the man who has been cut off. In a social situation few men would dream of acting or reacting in this fashion. Stripped of the machine we adopt a civilized attitude and allow people to cut in front of us, indeed we step aside often to permit people to board a bus or elevator ahead of us.

"A car, however, seems to act much like a dangerous weapon in the hands of many drivers. It can become a weapon that destroys many of our controls and inhibitions."

Later on he writes, "In a car, when our body zones are extended, we often feel free to drop the masks, and if someone cuts in front of us or tailgates us, we may loose tides of profanity that are shocking in their out-of-proportion emotions."

You'll have to admit that such reactions to invasion of space are fairly common. We have all become angry at someone who was discourteous enough to get too close to our fenders or our bumpers. But getting bent out of shape is no answer. The best solution is a more relaxed one: Keep your distance from other cars, and if they want a little too much togetherness, let them go by.

BLIND SPOTS

If for any reason you doubt the middle of the lane is the best place, remember that you can judge space to your left much more accurately. Keep to the left if there's any problem limiting the available space; that's the safer way.

Your mirrors can help you judge space, but remember that they leave some large "blind spots," areas they don't cover. The car itself blocks vision, causing other blind areas — a car width to the right, a car length or two behind, etc.

LANE CHOICE

The lane you choose to drive in affects the space you have also. You probably have a favorite lane you habitually use, for instance the left lane for fast travelling or the middle lanes for more choices of directions to take in the event of trouble. Here are some "elbow room" considerations to keep in mind in choosing a lane.

Give yourself as much room as you can on all sides for maneuvering. For this, the middle lanes are usually best, although right or left might be good in some instances.

You need to have good visibility. Low hanging branches from the median or the right shoulder could limit your vision, as could curves or hills. Watch for these and other sorts of obstructions that could hide other cars from you — and you from them.

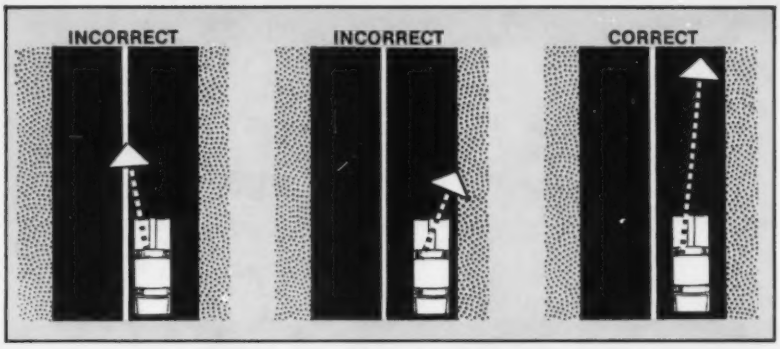
At times, traffic in one lane will move more steadily than in others. Choose the lane that offers steady, regular traffic because this will eliminate a lot of the speeding up and slowing down that varies your space cushion.

Sometimes the road surface will be poorer in one lane than in another, which could cause the same slowdown/speed-up problem. Choose the lane with the smoothest surface.

TIME AND SPEED MANAGEMENT

You need to be able to time when you will meet certain hazards on the road, and this involves adjusting the car's speed. Speeding up or slowing down will help you avoid a potentially dangerous situation. For instance, you would want to alter your speed to avoid meeting another vehicle just as it splashed through a puddle because that would obscure your vision.

Speed management would help you select the best place to encounter moving hazards. For example, you wouldn't want to meet a large truck on a narrow bridge, and you wouldn't want to try to pass another vehicle when opposing traffic is too close.



To be centered in your lane try to drive following an imaginary line down the center of the lane. Don't watch the fenders or the hood, because your sight line will be too low for good tracking; also, you won't be watching far enough ahead for hazards.

Most speed alterations will be decelerations. You need to slow down to give yourself time to make decisions on maneuvers and to make those maneuvers. The closer you are to a hazard, the slower you should be moving.

You want to make your moves when the road conditions are best, not when traction or visibility is poor. Avoid making a hazardous move when anything — weather conditions, signs, buildings — interferes with your vision. For instance, passing another vehicle in strong crosswinds is a bad idea, as is a lane change in a spot where there's a patch of ice.

OH, SAY, CAN YOU SEE?

Limited visibility is an especially important consideration. A reasonable speed for daytime might be too fast at night. As we said above, you can stop within a four-second distance. So if you're driving so fast that your headlights illuminate a distance only three seconds ahead, you're moving too fast. You need to slow down so you have more of a forward space cushion.

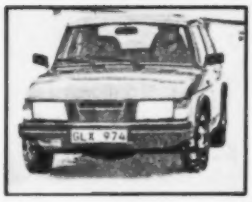
The same goes for weather conditions. If fog or rain limits your vision to less than four seconds ahead at your present speed, you should slow down.

KEEP YOUR DISTANCE

We hope this information on maintaining your elbow room has been helpful. If you can keep your distance from the other traffic on the road, the other concerns of driving become that much easier.

Slow down during bad weather, not only because of the reduced traction but also because of the reduced visibility.

SKIDDING



A recent letter asked us:

"Hey, DRIVER, what's up? In your October 85 issue, the article 'A Winter's Tale,' under Skids, you say the experts state — in front wheel drive cars — if a skid occurs, don't take your foot off the gas, 'because the drive wheels will slow down but the rear wheels will still be going the same speed, possibly making the skid worse. Instead, speed up slightly to keep the rear wheels behind you.' Then, in your November 1985 issue, under Timely Topics, 'Front Wheel Drive,' last paragraph says 'If you start to skid on a front wheel drive car, observe the "off" rule. Take your foot off the accelerator and off the brakes.' O.K., folks, who's telling the truth? I pilot a front wheel drive Tempo so I'd like to know, 'Press on or Keep Off'!!"

Well, we hate to talk out of both sides of our mouth, but the answer is "Both."

An item from the Automotive Information Council last winter, referring to front wheel drive autos, said "If you use too much speed going into a turn, *causing the car to slide straight ahead*, use the "off" rule." Et cetera. But notice the part we've put in italics. The condition described by those words refers to a front wheel skid, as opposed to a rear wheel skid. The front wheel skid is a fairly rare experience, while the rear wheel skid is common. We'll explain both.

A rear wheel skid in a front wheel drive car is handled differently from the way it's handled in a rear wheel drive car. Both items in October's DRIVER and the one in November's issue should have been more thorough. Here is a full answer.

For a rear wheel skid, rear wheel drive (Diagram A):

1. Steer in the same direction the rear wheels are skidding (that is, steer in the direction you want the car to head).

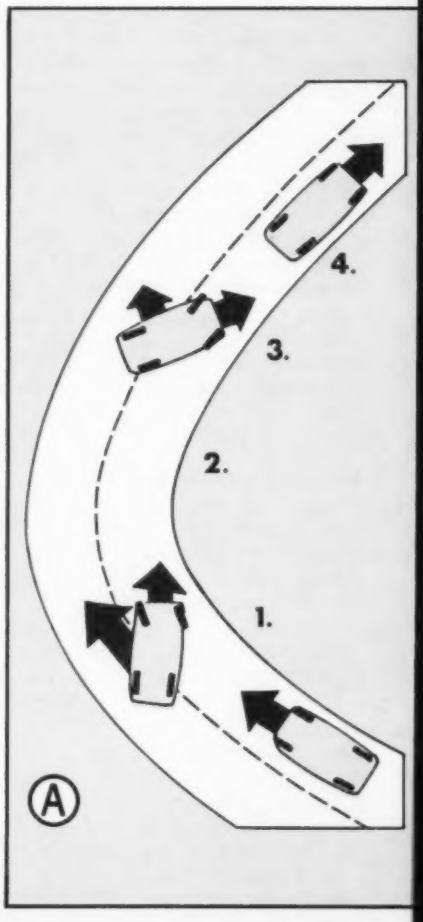
2. Push in the clutch on a car with a manual transmission, or take your foot off the gas on a car with an automatic. (On an automatic, don't go for neutral unless you're sure to get it the first time. If you hit another forward gear or reverse, you'll make the skid worse.)

3. Wait for the rear to stop skidding and then steer smoothly ahead so that you're moving straight again.

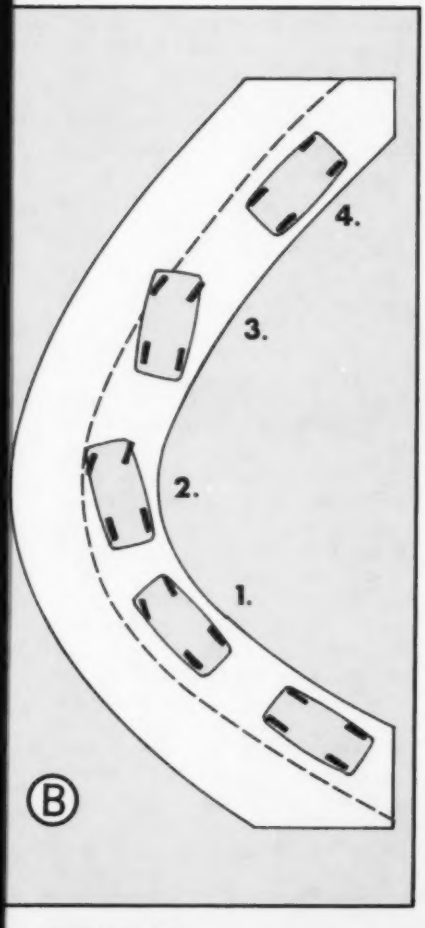
4. On rear wheel drive, the rear wheels might skid in the other direction. Steer to straighten the car with each skid. Steer smoothly and don't oversteer.

5. When you're back in control, let the clutch pedal out and proceed, accelerating gently.

There are differences when you have a rear wheel skid on a car with front wheel drive. Backing off the power on a rear wheel drive car provides some braking drag from behind, which aids you in regaining control. However, getting off the gas on a front wheel drive car might make the skid worse, because the



CONTROL



engine-braking force is in the front — the front would be braking while the rear would not. Therefore, here is the alternate method.

For a rear-wheel skid, front wheel drive (Also Diagram A):

1. Steer in the direction the rear wheels are skidding (in other words, steer to straighten out the car).

2. Disengage the clutch on a car with a manual gearbox. This will stop transmission of engine power to the front wheels — they will be coasting, just like the rear wheels. Or, speed up *slightly*, to keep the front wheels ahead of the rear ones. (Once again, don't try for neutral on an automatic transmission unless you're sure to hit it right the first time, because of the risk of getting into some other gear.)

3. When the rear wheels have stopped skidding, steer the car gently back, so that the front wheels point straight ahead when the rear wheels are back on course.

4. Release the clutch and press on the gas pedal gently so that the engine speed matches the road speed and accelerate gently.

If you have done all of this correctly, there is no real risk of the car skidding in the opposite direction.

For a front-wheel skid (Diagram B):

With front-wheel drive, when the front (driving) wheels lose traction, the car tends to go straight, no matter which way the wheels are turned.

Front wheel skids are less common and are therefore thought to be more dangerous, but Saab says they are easier to correct, with no danger at all of a skid in the opposite direction. (These instructions, by the way, are also true for rear-wheel drive cars.)

1. Don't move the steering wheel.

2. Disengage the clutch on a car with a manual gearbox or take your foot off the accelerator pedal on a car with automatic transmission.

3. Wait for the front wheels to grip again. Since the wheels are skidding sideways they exert a certain braking effort. As soon as the speed has dropped off enough for the road surface or the curvature of the bend, the car will start to steer again.

4. When the front wheels have gripped again, steer the wheels carefully to make up for what you have lost in the skid.

5. Release the clutch and depress the accelerator gently so that the engine speed matches the road speed and accelerate gently.

VELOCITY

The important thing to remember is that skids are generally caused by too much speed. Sudden turns, locking the wheels while braking, or sudden acceleration may cause the car to skid. To avoid winter skids, drive slowly. Slow down for turns or curves in the road, and always watch for changing road surfaces.

The Backward Mechanic on:

Brake Jobs

Maybe Dad knew something after all.

Another in an irregular series of items on car maintenance, presented as a "word to the wise." This is the wrong way. For the right way, consult this month's BackYARD Mechanic.

I have great faith in my talent with a wrench. I'm no expert mechanic, but I've done a number of basic jobs on my cars that have saved me some money. I've always felt that a reasonably intelligent person could do most simple auto maintenance, provided he had the right tools and strong enough fingers.

My dad taught me a lot. A mechanic by trade, Dad was very systematic about things like auto maintenance. He read the instructions for the job first, slowly and methodically. He made sure he had all the tools he would need before he started, and only those, and he placed everything within easy reach. After he used each tool he set it aside where it wouldn't be in the way. He consulted the instructions often as he worked, and he made sure he was finished with each step before he went on to the next.

When I helped him with the work as a kid, I often got impatient with him, wishing he'd hurry up so I could get back to my kid activities. He would explain in great detail what he was doing and why he was doing it. His endless stream of instructions annoyed me after awhile; why couldn't he see that I was a pretty bright kid and could do the job?

(You knew I wasn't paying close attention, didn't you, Dad? Well, I think I understand now. You were trying to make sure the message got through: Don't start until you know exactly what you're doing, and do everything completely and in order.)

But it wasn't until I tried to work on the brakes on my present car that I fully got that message.

When a garage mechanic told me I needed brakes, I thought he was looking for ways to make some more money. I knew I could do the job myself — I'd done it before with Dad — so I decided to wait awhile. There were demands on my time and my wallet that seemed more immediately important than my brakes. When I had the time and the money, I would do it. I put it off.

Meanwhile, I shopped around for a pair of brake spring pliers. Dad had a pair of these little gems, and they made the job of changing brake shoes a snap, literally. After a few trips to various auto parts stores and tool departments, I decided I would have to do without them. Nobody seemed to have them, and in more than a few places the salesmen gave me a funny look, like I'd made the tool up.

Then, a long while later — probably around four months — I remembered my intention to do the work. The weather had cooled. I had more money. I had the time I could devote to maintenance. One afternoon I decided I could take some time to do the job.

I felt well-prepared. I had the tools, except the brake spring pliers, and I had the jack stands, the bunch of rags, the work clothes. I had borrowed a Mitchell Manual from a friend who was well-stocked with such publications. I even thought of getting some denatured alcohol to clean off the discs and drums (I was really proud of that). I was ready.

Of course, I couldn't do the work at home. The rules of my apartment complex said "no working on cars in the carports." Working in the street was out, because of the clowns who roared up and down the street testing out the sound of their exhaust, and because I lived on a hill.

I finally decided to use a friend's driveway. I knew he wouldn't mind, and if I really needed it I could use his garage. If I could get him to move all the cars aside. If I could shove enough of the junk in the garage out of the way.

I saw no reason why I couldn't get the whole job done in an afternoon. I mean, why not? I was an intelligent person. Plenty of experience — I had done brake jobs before, and they weren't that difficult. I just needed to buy the parts and roll up my sleeves.

There were a couple of things wrong with that idea. One, I had never before done the job by myself; my father had always helped, or at least supervised. And two, Dad always had everything on hand before he started — because he read the instructions.

But I reasoned that it couldn't be hard to accomplish. I wanted to get it done by myself and then casually mention it the next time I called home. "How's the car running?" he would ask (as he always did). "Oh, fine," I would say (as I always did), casually adding, "I did the brakes

last week."

That afternoon when I decided I could spare the time off to do the job, I left after lunch and went to an auto parts store to buy the brakes. The first one had the pads for the front discs but not the shoes for the rear drums. (I wondered why they mixed systems — why not the same on all four wheels?) After I found a couple of other stores were also out of the shoes I needed, I decided to do the front brakes one day and wait for a later day to do the rear drums. It was better than nothing.

I drove to my friend's office to make sure it was all right if I used his driveway. As I expected, he told me "Sure, no problem," and then — as I should have expected — he got me involved in a project he was working on. Half an hour later, I realized I had messed up. The delay for lunch, plus the delays at the stores, plus this delay had pushed back starting time to the middle of the afternoon. A quick calculation told me I would run out of sunlight before I really got started.

I went to a video store and rented a movie.

A week later I had another chance, and I took off work to do the job. In the meantime, I had looked at the Mitchell Manual; it mentioned using a C-clamp to compress the brake caliper enough to remove it from the rotor. I had already purchased what looked like the proper size clamp. Satisfied that I had avoided Murphy's Law ("Whatever can go wrong, will"), I drove to my friend's house.

Only three of the five or so cars were there, but a couple of them were sitting in the driveway where I wanted to work. The garage was empty (well, it was full of junk but empty of cars) but the cars were partially blocking the entrance.

My friend's roommate was asleep in the house, but I decided not to wake him up. Instead, I cleared enough space to work on the garage floor and cautiously edged my car past my friend's shiny new Fiero.

Once inside, I quickly got busy. I got the tools and parts out of the trunk. I chocked the rear wheels with a couple of cinder blocks and assembled my hydraulic jack. (See, Dad? I'm well equipped). I consulted my car manual for the proper jacking points, loosened the lug nuts, raised the car and took off the wheel.

Then I looked at the Mitchell Manual. (I still hadn't read the complete instructions. I should have known better, Dad.) It said to remove most of the brake fluid from the master cylinder to prevent overflow when the brakes are compressed. I searched around and finally located the cap from a spray paint can, which I used to dip out the fluid into a styrofoam cup I found in the kitchen.

The next instruction was to apply the C-clamp and compress the caliper enough to free up the brake pads. I tried this.

The clamp was too small — it missed opening far enough by a couple of inches. I sat back and sighed. So much for action, I thought. I had no choice but to button up the car and try again another time. I was almost glad, it was on the verge of winter and the floor of the garage was pretty cold.

Fortunately, I hadn't thrown out the old brake fluid (the first thing I'd done right all day), because I didn't have any more. I replaced it, put the wheel back on and lowered the car. There was no question of getting another clamp and starting again, because that would take an hour at least and I didn't have the time to spare.

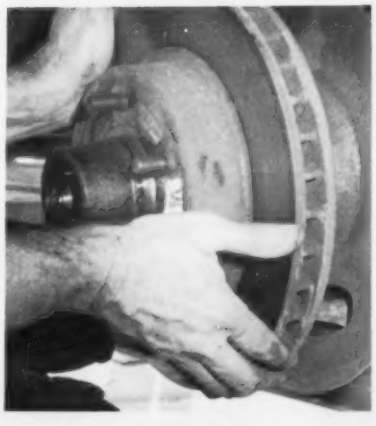
I got my friend's keys and moved his car so I could get out of the garage, surprised I hadn't thought of that before. Then I went off to do some errands — anything to salvage the rest of my day off.

I bought the proper sized C-clamp a few days later, but it was a couple of weeks more before I could take any time off for my next attempt at it. I also bought the shoes for the rear brakes — I don't know why; maybe I was still optimistic — as well as a big can of brake fluid and a bulb battery tester to remove the old fluid.

Things were different this time. I got started earlier. I was in the driveway, with plenty of light from the bright sunshine, and plenty of room for all the tools and supplies. I had learned by reading the instructions.

(At least that's what I told myself, Dad. I should have known better, because I still hadn't read them all.)

This time, I got the car chocked and raised, the wheel off, the brake fluid lowered and the brake compressed with my new, larger C-clamp before I hit the next snag. To remove the caliper I needed an allen wrench, a special, BIG allen wrench. The thing that bothered me was that, once again, I could have foreseen this if I had only read the complete instructions before I started.



I was just about to put the whole mess away in disgust when I got my first break. A friend drove up and asked if he could help. I enlisted him as driver and went to the auto parts store to get the wrench. Back at the car I spent the next half an hour trying to get the bolt to budge. I refused my friend's help, wanting to get the job done by myself.

It finally gave way to my efforts. I consulted the instructions again, and went off to find some wire to hold the caliper in place and protect the brake line. I returned with a coat hanger, which I bent up to serve the purpose.

When I got the brake pads off I discovered two things. One, that the brakes were in good shape. The pads, although worn, had enough left to last for a while; the rotors were completely smooth. Two, that it was getting cold outside. My hands were getting stiff. I could continue to work and replace the pads — and then be too cold to do the other front wheel — or I could stop and try again on a warmer day. I decided for even braking on both sides of the car, and for my hands.

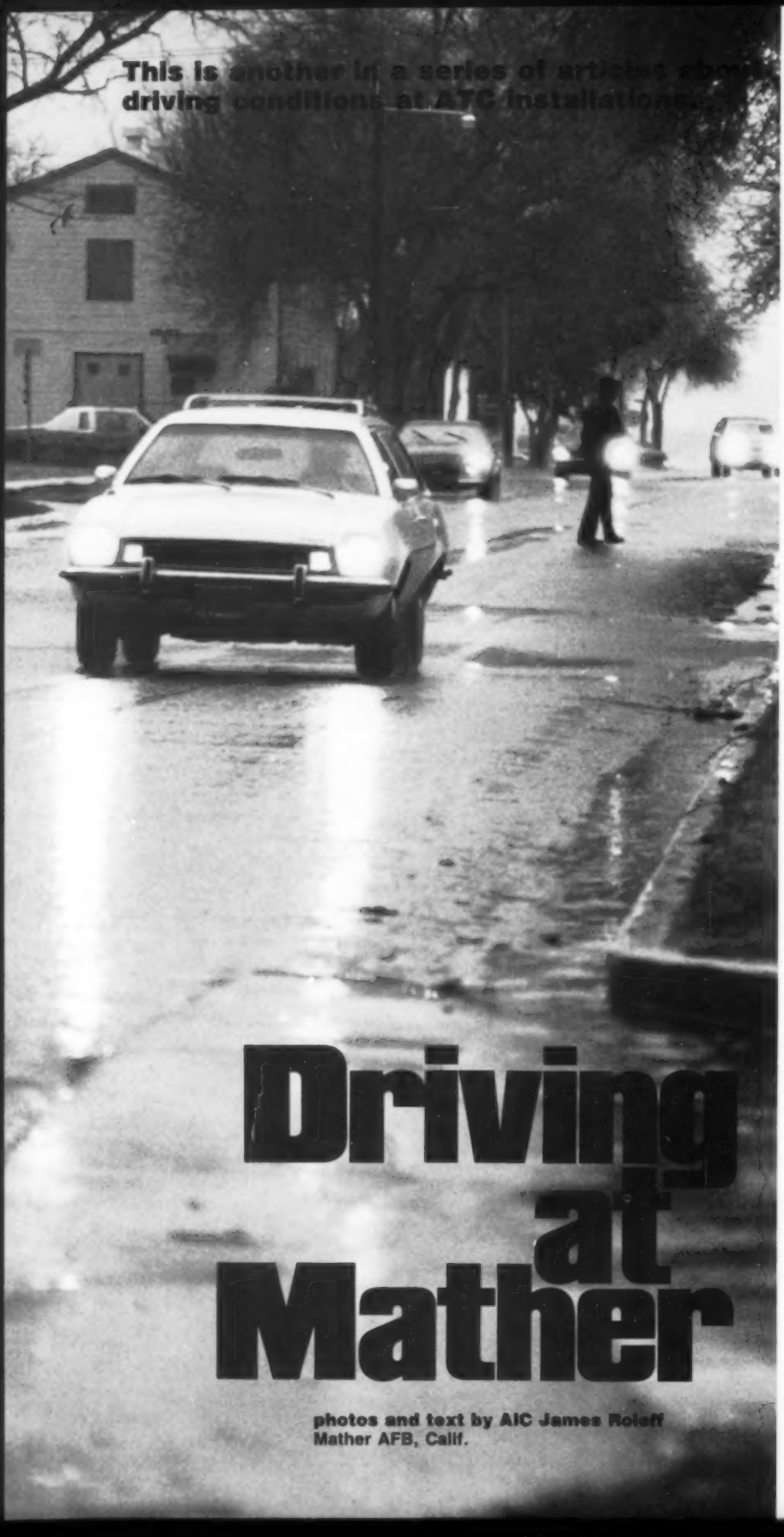
It was some weeks before I got another chance — a strange warm day with no breeze and no distractions. Without going into detail, I got the job done. (If you want the proper procedure, see this month's Backyard Mechanic.)

The day I got it done there was an important difference from the failed attempts, a couple of differences in fact. I had read the instructions carefully — all of them, beginning to end — noting any special tools or equipment I needed and obtaining it before I started. And I asked for help from a friend who has a special affection for getting grease under his fingernails.

I decided pride was less important than accomplishment. And the funny thing was, I still felt pretty good about doing the job myself, even with help. I did a necessary job and saved a lot of money, too.

What was that the boy scouts always said? Oh, yes, "Be prepared." That was my problem. I really could do the job; I just wasn't ready because I didn't have all the knowledge I needed. I had to do the necessary preparation, and I had to work carefully and methodically. Maybe Dad knew something after all.

Are you listening, Dad? You were right.



This is another in a series of articles about driving conditions at ATC installations.

Driving at Mather

photos and text by AIC James Roloff
Mather AFB, Calif.

A lot of people have the notion that California is all warm weather and sunshine. Not true. Winter weather changes frequently in the Sacramento Valley, where Mather AFB is located, and may be the most important factor when it comes to driving there.

Warm and sunny in summer, the valley climate turns to dense fog and wind-driven rain for much of the winter, causing poor visibility and extremely slippery roads.

One of the country's worst road accidents occurred just 15 miles from Mather in February 1984 because of fog. On Interstate 80, just outside of Sacramento, an elderly woman apparently did not see her exit because of the poor visibility conditions. She then immediately slowed to 25 mph and was hit by a car from behind, setting off a 60-vehicle accident.

Driving in heavy rainfall is another of the winter driving hazards dealt with on a daily basis. One way to combat it is to buy good deep-treaded radials to prevent hydroplaning (skimming the surface of the road on a sheet of water).

Other driving hazards at Mather include speed zones. Newcomers living in the housing area should be aware of the speed zones on Mather Boulevard in particular. On that one stretch of road, which leads to housing less than three miles away, the speed zones change seven times, ranging from 25 to 50 mph. One reason for the numerous speed changes is a sharp bend in the road. There have been a number of accidents there caused by a driver's failure to reduce speed.

But speed zones are only one of the hazards of Mather Boulevard. Another that poses a larger threat is the impatient drivers who follow too closely behind the slow-moving vehicles of the 320th Organizational Maintenance Squadron's aerospace ground equipment (AGE) section.

"There have been several near misses," says SSgt. Stephen Rice, ground safety technician. "And I just don't think they realize what a dangerous position they're putting themselves in."

The AGE drivers do, and it scares them. That's because of the cargo they're hauling: liquid oxygen, or LOX, and JP-4 jet fuel, both highly combustible.

"It's kind of scary to know you're hauling something explosive and look up in your rear view mirror to see a car speeding up your tail," says MSgt. Floyd L. McDowell, noncommissioned officer in charge of the AGE section.

LOX explodes on contact with oil, such as that found in asphalt. It also explodes instantly on contact with hydrocar-

An aerospace ground equipment driver begins the three mile haul of liquid oxygen and JP-4 jet fuel on Mather Boulevard. Impatient drivers have been known to follow too closely behind the highly combustible materials.

bons, such as those found in radiator antifreeze or engine oil. Explosives experts say that if two LOX carts (the usual number being towed) explode, it would equal approximately 20,000 pounds of dynamite. That is enough explosive power to cause major damage to every building within one half mile of the explosion, and probably break every window within a mile and a half.

The vehicles must travel from the main side of the base to the Strategic Air Command alert facility near the housing area. They enter Mather Boulevard from the flightline and travel to the SAC alert pad, making at least one round trip daily, and sometimes as many as three.

"Being ready to slow down is the key," according to Sergeant Rice. "Impatience with the driver will do you no good; he can't go any faster and he can't get out of your way. To pull over to the side of the road would mean further hazards for the driver. If the tires of the unit being towed go onto the dirt shoulder, there is a strong possibility of the unit tipping over."

Safety officials recommend that each vehicle take its turn when passing the tractors and that drivers be patient.

"If you have time to pass, it's better to do so if you can see far enough ahead to ensure safety," continued Sergeant Rice. "A long line of cars behind the tractor compounds the hazard, but sometimes that will be the case."

About midway through the trip to the Stragetic Air Command Alert Facility, vehicles begin to form a long line behind the LOX cart. Drivers should be aware that they may pass the cart, but should use caution.

Timely Topics

WHO'S HARD ON CARS?

If you're one of those rare people who has taken the trouble to look up periodic service recommendations in your car owners manual, you may have seen double and triple asterisks referring to "severe service" operation.

The term does not necessarily denote someone who daily climbs Pikes Peak or asks his subcompact car to perform Herculean tasks. In fact, says Car Care Council, the time-worn idea that the best buy in a used car is the one that has been driven by the little old lady who ran only three miles to and from the grocery store is a thing of the past. She may qualify as a severe service driver and not even know it. Before buying her car, take a close look at her maintenance records!

Many of the driving habits that we think of as "typical" can be very hard on a car, especially in certain combinations. Example: short trips (ten miles or less) and stop-and-go driving such as might be encountered in city traffic or on a delivery route combined with unusually hot or cold weather are hard on a car. Towing a trailer or otherwise hauling heavy loads on a regular basis is considered severe service, too, especially in hilly terrain.

While this kind of driving is the exception rather than the rule, people who do fall into these categories should be careful to observe owner's manual maintenance recommendations when they apply.

Especially important is constant checking of vital fluids such as engine oil, transmission fluid, anti-freeze/coolant, brake fluid and power steering fluid. Failure to check and change fluids and filters on schedule can cause rapid engine and/or transmission wear and premature failure of these major components.

The Council emphasizes the importance of recognizing evidence of possible automatic transmission damage due to the intense heat and stress that can result from something as commonplace as extended periods of trying to rock a car out of a snow drift. When the transmission fluid has turned dirty brown and smells burned, do not delay changing the fluid and filter. It could help avoid a major overhaul expense.

UNLEADED GAS AND OLD ENGINES

Tests performed by Phillips Petroleum indicate older engines will suffer extensive damage if run with unleaded gas. Recent tests on farm engines show the use of unleaded fuel in older engines under moderate load resulted in substantial valve seat wear. The Phillips' study showed the valve system wear increased by more than 10 times when unleaded fuel was used in engines without hardened valve seats.

DO YOU SPEAK AUTOMOBILESE?

Since many people rarely use words like "alternator" or "master cylinder" in everyday conversation, this car language, or "automobilese," can be intimidating for some consumers when it comes time to take the car in for repairs. To make communicating with your mechanic easier, Automotive Information Council (AIC) has compiled a list of a few automotive parts and their function in the automobile.

ALTERNATOR — A belt-driven generator on the engine which produces AC current which is converted to DC current to charge the car's battery.

DISTRIBUTOR — A mechanical device containing the breaker points that distribute high voltage electricity to the proper spark plug at the proper time.

DRUM BRAKE — A brake design in which a component much like an open end drum is attached to the wheel. Brake shoes are forced against the inner surface of the drum to provide braking action.

BRAKE SHOE — A semi-circular metal plate located within a drum brake. It is lined with a high-friction material called a brake lining.

DISC BRAKE — A braking system used mainly on the front wheels of cars. Braking force is applied by two friction pads that are squeezed against a rotating disc by a caliper much like a clamp.

MASTER CYLINDER — A piston and cylinder assembly of the brake system which is filled with brake fluid. As the car's brake pedal is depressed, hydraulic pressure is developed in the master cylinder and this force is transmitted to the individual wheel cylinders and/or calipers.

CHOKE — A plate near the top of the carburetor that enriches the air-fuel mixture by restricting air flow to the engine.

CLUTCH — A mechanism that connects and disconnects the engine from the transmission.

By closing the car language communications gap, says AIC, there are fewer opportunities for misunderstandings and resulting auto repair complaints.

RADIATOR HOSES ARE NOT FOREVER

The rubber hoses under your car's hood are called upon to perform some difficult tasks in a very inhospitable environment. They are subjected to pressures nearing 18 pounds per square inch and under-hood temperatures that often exceed 280 degrees fahrenheit. On top of all this, the radiator hoses are required to circulate about 7,500 gallons of hot coolant per hour.

Automotive hoses can provide long service life, but they are by no means permanent items. Often, bad hoses exhibit clearly visible signs of wear such as a hardened or cracked cover, swelling at the end(s), swelling and softening of the cover, scuffs, leaking at the clamp, collapsing, or perhaps a bulge or bubble between the cover and tube.

These signs of a failing hose are easy to spot with a careful inspection under the hood. However, warns Car Care Council, a hose can fail internally as well, with little or no external signals. Deterioration can start from within, causing small hose particles to flake off and fall into the coolant. These tiny bits of rubber can clog the radiator cooling tubes, hold a thermostat valve open or plug coolant passages.

To inspect a coolant hose internally, you must drain off some of the coolant. Drain two to three quarts of coolant from the radiator to inspect or replace the upper radiator hose. However, if you must inspect or replace the lower radiator hose, you will need to drain all the coolant from the radiator. This suggests that a good time to check these hoses is whenever coolant must be added to or flushed from the radiator.

Recognizing the signs of hose failure can help keep your car or truck on the road. Take time routinely to inspect hoses, rather than risking failure on the road.

TRUE ACCIDENTS

Following are a few reports of accidents involving Air Force members. We have removed names and references to dates and places.

HEAVY DRINKER

A master sergeant attended a commander's call at the end of the work day. He drove a friend back to their dormitory in his small pickup at four in the afternoon. Nobody saw him between then and 6:30 that evening, when he went to the friend's room to ask help in tightening the alternator belt on his truck. The friend said the master sergeant did not appear drunk at the time, although he had one drink containing whiskey while they worked. When they completed working on the pickup at 7:30 the master sergeant drove east on an interstate freeway, intending to visit a city about 125 miles away. He did not wear the seat belt. About nine that night, when he was about 65 miles from the base, he took an exit ramp for some reason. On a slight right hand curve on the ramp, his truck collided with a concrete retaining wall. The truck was not severely damaged, and its interior was completely undamaged, but the unbelted driver crashed into the steering wheel and dashboard, receiving severe head and internal injuries. He was found dead, lying across the seat. An autopsy put his Blood Alcohol Level at .31, which is three times the legal definition of drunkenness. Four empty beer cans were found in the truck (the friend had seen none when they came home from work). Investigators discovered the master sergeant had bought a half-gallon bottle of whiskey and a six-pack of beer the day before the mishap. Numerous empty beer cans and the whiskey bottle, half-empty, were found in his room. A single cigarette, open cigarette pack and lighter lying by the driver's feet led investigators to speculate the accident might have happened when he diverted his attention from the road to light a cigarette.

FATIQUE

Two airmen were on leave, on a trip of over 1100 miles, on their way to visit the driver's girlfriend. They had scheduled to take leave beginning on a Monday. However, the driver got off duty at 9 p.m. on the Friday before, and they left sometime after that. About 1:20 the next afternoon they were 900 miles from the base, driving north on an interstate highway in a rural area. The driver fell asleep at the wheel and the car drifted to the left onto the median of the highway. The driver steered back onto the road, but overcorrected. The car spun and then rolled, coming to rest facing south against a barbed wire fence. Both airmen were thrown from the car. The driver suffered cuts and bruises over much of his body. The passenger suffered cuts to the neck and head and he bled to death at the scene of the accident.

LEFT TURN

An airman was riding his motorcycle back toward his base at 9:30 p.m. He was traveling west in the inside lane of a four-lane undivided street, and he was exceeding the speed limit. A car going east attempted to make a left turn from the outside lane. It turned directly in front of the motorcycle. The airman braked and skidded 82 feet before hitting the car at the door post on the right side. He died of massive head injuries.

DRINKING AFTER WORK

A senior airman left work between 4:15 and 4:30 in the afternoon. He apparently went to a bar. About 7:45 that evening he was driving his car west outside the base at high speed. A witness saw him attempt to pass a pickup at about 70 mph. The car came up behind the pickup and swerved to the left, out of control. The car skidded for nearly 200 feet, hit a small ditch and flipped over, landing upside down in front of a residence. The airman was dead at the scene. His BAL was .22.

FOUR AF DEATHS

An airman first class, a sergeant and an airman were at a party at a friend's house. The airman first class, who had driven them over, and the sergeant began drinking whiskey at around 6 p.m. and continued drinking until about 10. Then they decided to go to a town about 10 miles west of the base. Since the airman had not been drinking, they decided she should drive. However, for some reason the airman first class drove anyway. They drove west on a two-lane asphalt road that had a number of hills. Driving at high speed, about two miles outside the base they overtook a slower vehicle on a hill. The driver started to pass as they reached the crest of the hill, while they were still in a no-passing zone. Traveling east was a master sergeant driving his wife and child back to the base. The master sergeant tried to avoid the collision by steering to the right; the airman first class took no evasive action. The two cars collided head-on. The car of the airman first class spun around, throwing the driver out. It came to rest on the north side of the road, 90 feet away from the point of impact, and began to burn. Some passers-by stopped and pulled the passengers out of the car before it was burned severely. The master sergeant's car was knocked back and sideways, stopping in the ditch on the north side of the road 35 feet from the impact point. The airman first class, sergeant and airman were dead at the scene; none of the three had worn the available seatbelts. The three in the other car were all wearing seatbelts. They were transported to the hospital, where the master sergeant was dead on arrival from head and internal injuries. His wife and child suffered head and other injuries. The airman first class had a .08 BAL.

AMPUTATION

A staff sergeant was driving south in his pickup about 2:10 in the afternoon from his overseas base to a moving company where his household goods were to be reweighed. He drove through a 30-foot wide area where raw sewage from a septic tank had run across the road. Just then, he saw five civilians emerge from a vehicle that was stopped on the left side of the road. They started across the road and then stopped in the middle of the southbound lane as they saw the staff sergeant's pickup coming. The staff sergeant braked hard and locked his wheels, causing him to lose control of the pickup. The pickup collided with a small northbound motorcycle, throwing off the civilian rider and severely injuring him. Doctors had to amputate one of his legs about ten days later.

psssssst!

what does your car say about you?

Your car makes a statement about you. In fact, it probably tells other people more about you than you'd like them to know.

Among other things it can tell people about your personality, your ego, your habits, your pride, your social consciousness, your musical taste, the care you take of things and, believe it or not, your attitude towards safety.

For example, a bright red Corvette would tell most people that you have a rather large, aggressive personality and seek an upward place in society. How clean it is kept would give other's strong hints about your pride and a couple of punches on your radio buttons would certainly eliminate any doubts about your musical tastes.

As for your attitude towards safety, one look at the exterior and the tires and everyone knows all they need to. Knicks, prangs, dents and/or major damage to the body go a long way in saying that you aren't very careful at slow speeds.

But your tires say the most about your outlook on safety. If they are bald, worn badly or underinflated it's plain that you just don't care about your own safety — or anybody else's for that matter. Also, tires that aren't the right size for the vehicle or are mis-matched say you have a poor mind toward safety.

Look around you. What do you think of those driving the other cars on the road? Now, what do they think about you?

Yes, most of these are vehicles for macho men, but what else can you tell about them from what you see here?

One close look at a bald tire like this tells you a great deal about somebody's attitude toward safety.

DO MOTORCYCLE SAFETY FOUNDATION PROGRAMS WORK?

by MSgt. Ron Shepard
Manager, U.S. Air Force Motorcycle Safety Program
HQ AFISC
Norton AFB, Calif.

Motorcycle accidents are the third largest cause of accidental death in the Air Force. Only cars and aircraft kill more people every year. With over 600,000 military and 250,000 civilians employed in the Air Force and an estimated 100,000 motorcycles being ridden, it is of little surprise that the Air Force takes motorcycle safety seriously.

Fiscal Year (FY) 1985 was not a good year for the 37 Air Force people who died as a result of motorcycle accidents. It wasn't much better for the 530 folks who were hospitalized as a result of 496 mishaps. But for the Air Force number crunchers, FY 85 was a banner year. Fatals and total injury accidents were down for the third straight year. Since 1982, fatal mishaps have dropped by 35 percent and total injury mishaps by 45 percent, even though motorcycle registrations were up 54 percent during the same period. Impressive? Yes! Lucky? Not by a long shot.

Before the Motorcycle Safety Foundation (MSF) came along in 1973, Air Force motorcycle safety programs were, for the most part, locally (and in some cases, command) developed, based on what the person who developed the program felt should be included. Such things as building blocks or a task analysis didn't get in the way of these safety-minded individuals who honestly wanted to make the sport safer, but didn't really know how. The effort was disjointed and the results were marginal. Motorcycle license endorsements for riders were rare, as were quality training programs.

During 1973-4, the Air Force produced four 25-minute films on motorcycle safety in an effort to reduce accidents (48 fatals, 679 injuries and only an estimated 20,000 registered motorcycles Air Force-wide in 1973). The MSF, still less than a year old, reviewed the scripts and final product and gave the films their blessing. These films were required viewing for all Air Force personnel who wanted to ride a motorcycle.

The films, along with a mandatory requirement to wear a helmet, eye protection and have the headlight on while riding on base, was the extent of Air Force involvement in motorcycle safety. Individual bases and commands continued to develop and run their own motorcycle safety programs — if they felt one was necessary or required.

In September 1974, the first batch of Air Force instructors were trained by the MSF (Jim Bloomquist and Jim Smith) to teach the Beginner Riding Course (BRC). There were no instructor guides or range cards, just a student workbook. Not great by today's standards, but much better than anything available at the time. For the next six years, Air Force instructors continued to be trained by MSF staff personnel. MSF programs started showing up on Air Force bases. Training increased while fatal mishaps started to drop. Still, there was no focal point and the effort was fragmented with mixed results. The fatality count was like a yo-yo — up one year, down the next.

It wasn't until the MSF decided to train chief instructors that the Air Force motorcycle program really got off the ground. In September 1980, a group of 11 Air Force chief instructors were trained, one of them being Carl Spurgeon. Trained as a BRC instructor in November 1974, Carl had remained very active in MSF programs over the years. Now he was in a position to do something for the whole Air Force.

Carl had been assigned to the Air Force Inspection and Safety Center in the spring of 1980 in order to write Air Force Occupational Safety and Health Standards. After becoming a chief instructor, he began to spend every spare minute and a

lot of overtime analyzing motorcycle accidents and trying to find a way to coordinate the Air Force's effort in the area of motorcycle safety. In April 1981, Carl and Clif Burdette conducted one of the first Air Force instructor work shops taught by Air Force chiefs. By the summer of 1981, Carl had convinced the powers in being that the motorcycle program required a focal point in order to direct a concentrated effort towards reducing motorcycle fatalities and mishaps. He was reassigned to the Traffic Safety Branch as manager of Air Force motorcycle safety programs.

Carl dug in and got to work. By the end of 1981, he had coordinated and organized 18 instructor preparation workshops which resulted in 165 new instructors. At the time, there were 21 Motorcycle Rider Courses (MRC), 13 Better Biker Programs (BBP) and four Motorcycle Operator Skill Test (MOST) sites established throughout the Air Force. Over 5,000 personnel were trained in the MRC and BBP. Almost 800 were evaluated using the MOST. Registrations had climbed to an estimated 50,000. The Air Force won the MSF Motorcycle Rider Education Award of Appreciation for the first time. Still, the mishaps continued to climb. The national rate was 8.61 fatalities per 10,000 registrations; the Air Force rate was 8.8.

Nineteen eighty-two was bound to be a better year as more programs were started and more instructors and students were trained. Seven new MRC sites, 20 new BBP sites and 15 new MOST sites were started in 1982. Fourteen instructor preparation workshops trained an additional 126 new instructors. Over 6,400 Air Force people were trained in the MRC and BBP while 6,000 were MOST-evaluated. However, none of it seemed to make a difference because fatalities rose 30 percent to 57 and injuries rose six percent to 895. The national rate was 8.12, while the Air Force topped out at 8.77.

The front office began to ask a lot of questions. Why wasn't the program working? Was the Air Force encouraging people to ride motorcycles? Why was the accident rate taking off like the space shuttle? Knowing that it's always darkest before the dawn, Carl maintained a steady hand at the helm and weathered out the storm. Surely the tide had to change. MSF programs were the answer, weren't they? Carl never faltered. Training had to be the answer, not the problem.

As in 1982, the Air Force hosted the 1983 National Chief Instructor Course at Mather AFB, Calif., receiving five new chiefs as a result, bringing the Air Force total to 15. These 15 chiefs taught 30 instructor preps, certifying 315 new instructors Air Force-wide.

Early Air Force motorcycle training courses were locally developed.

Almost 9,000 students were trained using the MRC and BBP. Another 9,000 were evaluated using the MOST. Training sites multiplied: seven MRC, 25 BBP and three MOST sites were added to the growing list. The trend finally started to decline. Fatals were only down by one (56), but total mishaps were down by 118! Registrations had increased to 70,000. For the first time, the Air Force was below the National rate of 8.02 with a rate of 8.0. Was it all a fluke? Time would tell.

Nineteen eighty-four told the same story. The Air Force again hosted the National Chief Instructor course, this time at Holloman AFB, N.M. Twenty-three instructor preparation courses yielded another 168 instructors. Over 12,000 Air Force members were trained using the MRC and BBP, while another 11,000 were MOST evaluated. Training sites increased to 39 MRC, 70 BBP and 47 MOST locations. While registrations continued to climb, fatalities dropped a whopping 21 percent and total mishaps decreased 15 percent. The National rate hovered at 8.48, while ours plummeted to 5.17. The Air Force motorcycle films had become outdated and were replaced with the MRC software at all 130 major installations worldwide. The Air Force was also awarded the MSF Motorcycle Rider Education Award for the fourth consecutive year. Carl retired from the Air Force at the end of 1984 and was quickly snatched up by the MSF (they know talent when they see it!), where he is currently the acting director of licensing. Carl was also the recipient of the John E. Harley Memorial Award for 1984 — a well deserved honor.

Fiscal year 85 saw a continuation of the trend started in 1983. Over 13,000 students trained in the MRC and BBP, while another 12,000 were MOST-evaluated. Fatals decreased another 16 percent, while total injury mishaps fell 25 percent. We are currently losing 3.7 people for every 10,000 motorcycles registered —

continued

During the September 1980 chief instructors' workshop, chief instructor candidates (from the right) Ron Hubers and Carl Spurgeon observe the teaching techniques of an instructor candidate under the watchful eye of MSF staff trainer Jim Riley.

continued

MOST (Motorcycle Operator Skill Test) is part of the overall program.

Of course, motorcycle safety courses include some classroom work.

a far cry from 8.8 in 1981. As of the end of 1985, the Air Force sponsors a total of 76 certified Rider Education Recognition Program (RERP) training[1] sites in support of 121 MSF courses worldwide.

Since 1981, our 15 chief instructors have conducted 102 instructor preps, certifying 905 MSF instructors, of which an estimated 614 are still certified. These instructors have, in turn, trained 18,962 MRC students and 28,392 BBP students. Another 39,069 riders have been put through the MOST to determine their skill level. In all, 109,821 motorcyclists have at least attended the classroom portion of the MRC material.

How did all this training come about? Did the Air Force mandate training? No! The Air Force still requires only four hours of classroom training. However, we highly recommend that each motorcyclist be given the opportunity to attend an MRC, BBP and/or the MOST. Several of the major commands and many individual bases do direct that one or more of the training/testing programs be completed. Many other bases provide the training on a voluntary basis. In any case, *all* Air Force instructors and chiefs are non-paid volunteers. There currently is no system/directive in effect to direct or

Motorcycle safety instruction is not limited to the lower ranks.

allow these people to teach as part of their normal duties. Each and every one of them has a job unrelated to motorcycle safety — from flying aircraft to driving 18-wheelers. Every one of them must get permission to be away from their normal job (unless they are off duty) to teach motorcycle safety classes. Sometimes instructors must work overtime and weekends to make up the time lost while teaching. However, in most cases, commanders and supervisors realize the value of the program and will allow their instructors time off to teach, provided the mission is not hampered.

If it weren't for the conscientious, diligent, enthusiastic, dedicated devotion and motivation of the Air Force chief instructors and instructors, the Air Force wouldn't have a program. It is only through their willingness, perseverance, determination, and tenacity and a sincere desire to save lives that the Air Force has been able to obtain such a remarkable drop in motorcycle fatalities and mishaps.

Do MSF programs work? Did rider education really make a difference? You decide. We in the Air Force have no doubt, especially when 34 lives and $4.5 million have been saved over the 1982 level.

[1]The RERP number certifies a location is teaching an accredited course with MSF instructors. The number is required to obtain certificates of completion and loaner motorcycles as well as to get U.S. Air Force manpower credit for administration of the program.

CROSSING RAILROADS

If playing games while driving is foolish, then playing tag with trains at railroad crossing is moronic. Becoming "it" at a grade crossing usually means you lose. And losing a contest with a train is often very final.

In fact, in 1984 610 people lost their lives at railroad crossings and 2,733 were injured. Of those killed, 543 were in motor vehicles, while 2,597 of the injured were in cars and trucks.

Such accidents should never happen.

Railroad companies and highway departments have clearly marked the more than 350,000 railroad grade crossings in the United States with warning devices.

There are advance warning signs that tell you to look, listen and slow down because you may have to stop. For example, an "X" painted on the pavement with the letters "RR" tells you that you're approaching a crossing.

Crossbuck signs will be found at most crossings. And if there is more than one track, the sign below the crossbuck indicates the number of tracks.

A few states even require stop signs at all railroad crossings.

Many railroad crossings have flashing light signals. Always stop when the lights begin to flash because a train *is* coming. Don't cross the tracks until you can do so safely. If there is more than one set of tracks, be very sure all the tracks are clear before proceeding and then only after the lights have stopped flashing.

Should crossing gates block your normal path, don't attempt to drive around them. Stay in place until the gates are raised — besides, it's against the law to go around such gates.

It is up to you to learn how railroad grade crossings are marked and prevent train-car accidents. All you have to do is:

- **Keep an eye out for** railroad crossing warnings.
- **Expect a train** on any track at any time.
- **Look out for second trains.** When the last car of a train passes don't start up until you're sure no train is coming — in either direction on the same or another track.
- **Never race trains.** You won't get a rematch if you lose.
- **Don't get trapped** on a crossing. Wait on the approach until you're sure you can clear the crossing.
- **Don't shift gears** on the crossing.
- **When in doubt, stop.** Judging the speed of a train is very difficult.

Also be sure to watch vehicles that must stop at all railroad crossings. Be prepared to stop when you're following buses or trucks.

Beyond actual train-vehicle confrontations the biggest problem most drivers have with railroad crossings is the physical condition of the grade. The gap between the tracks and the road surface is often enough to seriously jar your teeth.

As if that isn't enough, the crossing surface can often be a serious threat to your comfort and vehicle control. There are wood boards that go in every direction except level with the tracks. In other cases the asphalt or other paving materials haven't been properly maintained and present some of the worst potholes ever encountered.

As serious as these problems are for car and truck drivers, they're twice as dangerous for motorcyclists.

Don't think that these problems are being ignored. More than $118 million in federal funds have been allocated for highway-railroad safety improvements under the Highway Safety Act of 1982. The Act provides money to states for highway-railroad safety improvements which also include crossing surfaces.

One such improvement is the installation of rubber crossings. While there are over a dozen different types of grade crossing surfaces, rubber railroad crossings are today's fastest growing surface type.

"In 1976, there were approximately 255 rubber crossings installed across the U.S.," said Goodyear's rubber crossing expert Don Johnson. "By last year, more than 1,898 rubber crossings were installed, replacing other types such as treated wood, asphalt and pavement materials."

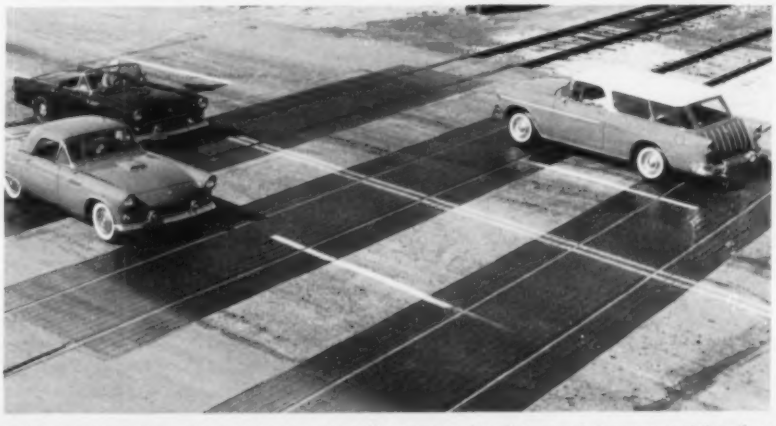
One of the most aggressive communities switching to the rubber crossings is Glendora, Calif. This small city of 42,000 northeast of Los Angeles has nine crossings.

"Five of our crossings are Goodyear rubber," said Art Cook, Glendora's director of public works. "As recently as three years ago, we didn't have any rubber crossings.

"The initial cost (of the rubber crossing) is greater than wood or asphalt, but the rubber lasts much longer and requires virtually no maintenance."

In fact, one of the first Goodyear crossings was installed in New Britain, Conn., in 1955 and still is in operation.

However, regardless of the type of crossing material it is not only against the law to disregard railroad grade crossing signs, signals and rules, but the penalty for ignoring them could be your life.



Rubber railroad grade crossings such as this require virtually no maintenance and therefore reduce one of the hazards motorists face.

DELIVERING

GOOD BRAKES

(Editor's note: The information in the following article is for all *drivers whether they are backyard mechanics and do their own maintenance or pay others to do the work for them. While the photographs show a typical auto hobby shop, do-it-yourself front disc brake job, the text contains information necessary to know when brake work is needed and what has to be done to get a quality brake job.)*

(center)
Before doing any work, remove all jewelry.

(top left)
Loosen the wheel lugs before lifting the vehicle off the ground.

(above)
Once the vehicle is securely supported, the wheel can be removed.

Cars that won't go aren't as dangerous to their drivers and passengers as those that won't stop. Additionally, to be safe the stopping must be done straight, smooth and in as short a distance as possible.

Therefore, the braking system is the most important part of your automobile.

It's extremely important that you know the signs of brake trouble. And it is equally important that you follow up the first sign of trouble with a top-quality inspection and repair.

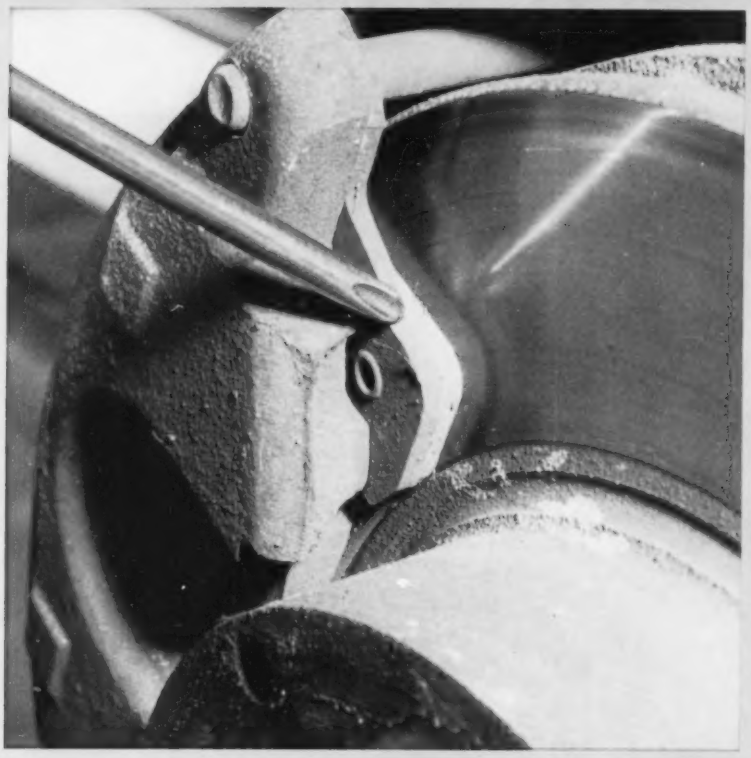
The brakes will warn you of trouble with noises and feelings.

One of the most obvious noises brakes make is squealing. In fact, the pads on some late model cars have built-in wear sensors. These sensors give a high pitched squeal when the wheels are rolling but the brakes aren't being applied to tell you that pads are worn out.

Noises that happen when the brakes aren't being applied could also mean that there is dust or oil on the drums or rotors.

Any squeaking noise could signal that the front disc pads or rear drum linings are worn.

Noises that occur when the brakes are applied can also be the result of insulator damage to the outboard shoe or installation of the incorrect pads or linings.



(left)
One quick glance and you'll see that the brake pad friction material has been worn down to less than ⅛-inch thick.

(above)
Once the bolts have been removed, the caliper can be lifted off the assembly.

With the proper tool or wrench, remove the mounting bolts.

With the caliper safely wired in place so that the hose will not be damaged, the pads can be removed.

However, a metallic grinding noise means the lining is completely worn away and you have metal-to-metal contact. Not only do you not have brakes at this point, you also are causing extreme and expensive damage to the rotors or drums.

Other warning signs can be felt.

If the brakes pull to the left or right then there could be restricted brake lines or hoses, a loose or malfunctioning caliper, bent shoe, oily linings, or malfunctioning rear brakes. Other non-brake system problems that can also cause pulling are: incorrect tire pressure, a front end that's out of alignment, mismatched tires or loose suspension parts.

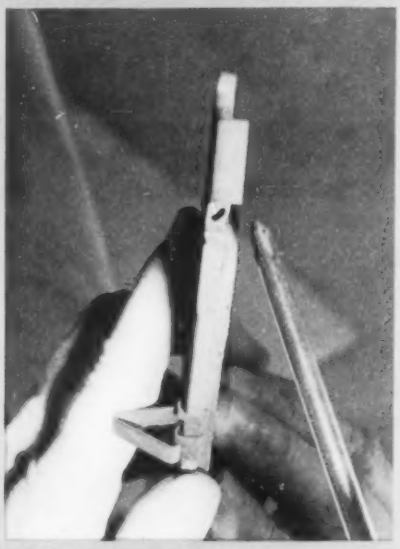
Brakes that are rough, chatter or pulsate could be the result of uneven rotor wear from some machining problems such as excessive lateral runout or parallelism not being to specifications. The rear drums could also be out-of-round. This also happens when the disc pads have been installed backwards with the steel against the rotor. Of course, not having the wheel bearings adjusted properly also produces the same effect.

Pulsation or roughness can also be caused by uneven pad wear because of caliper problems.

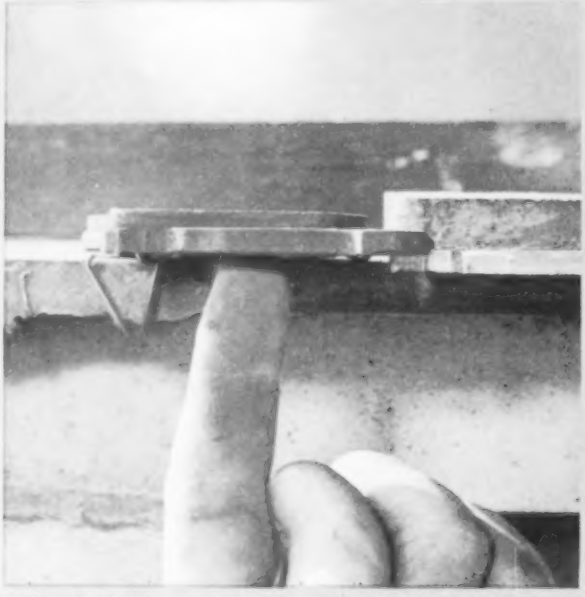
A malfunctioning combination valve, defective power brake unit, or binding

continued

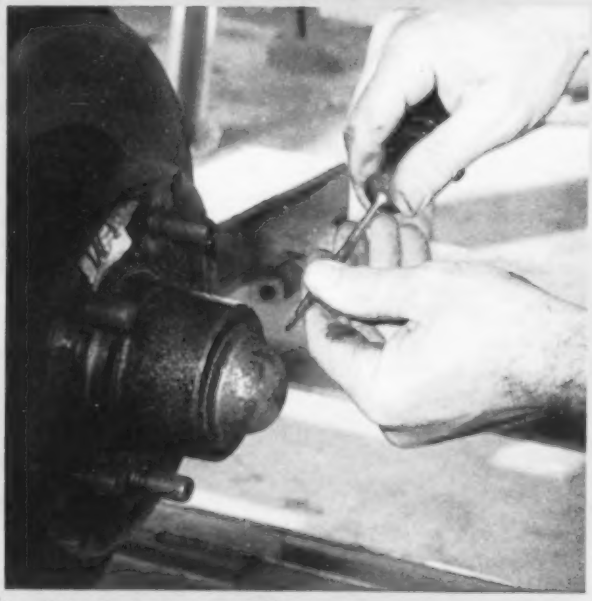
Run your fingernail over the rotor surface. If your nail catches, the rotor will have to be machined.



This tab on the end of the pad is the wear sensor that was making noise to tell you it was time to change the brakes.



Notice the friction material thickness difference between the old pad on the left and the new one.



Carefully pry the dust cover off.

brake pedal will produce grabbing or uneven braking action.

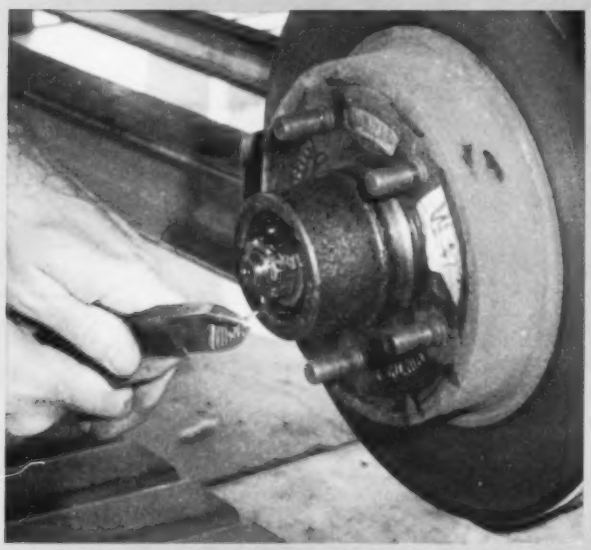
Several problems can cause dragging brakes from master cylinder pistons that aren't returning to a brake pedal that is hanging up. They could be caused by incorrect parking brake adjustment or a parking brake cable that is frozen. Certain restricted brake lines or hoses can also cause dragging brakes. Or if the inboard disc pad gets installed wrong, it will drag.

A lot of your feel for the brakes comes from the pedal.

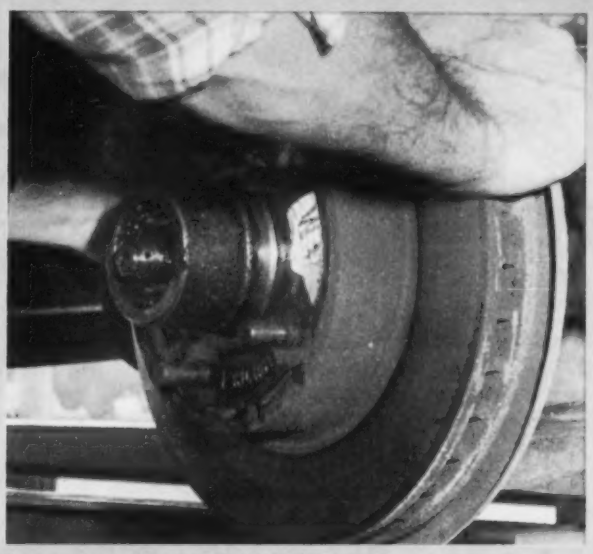
If your pedal requires too much effort to operate then there's a good chance you have a malfunctioning power unit or a partial system failure. Caliper pistons that are stuck or sluggish produce the same excessive pedal effort as does a master cylinder piston that's stuck.

Other problems that show up requiring you to put extra effort into the pedal include worn disc pads or linings, brake fade because of incorrect pads or linings, linings or pads that have been glazed, or worn drums.

Another pedal-felt problem may be too much travel. This can indicate a partial brake system failure. There might not be enough fluid in the master cylinder, or the brake fluid might be the improper type or the master cylinder cap might be



Remove the Cotter pin and throw it away.



Now remove the outer wheel bearing.

Then carefully remove the rotor.

Remove the old grease seal.

plugged. Air trapped in the brake system would also produce too much pedal travel.

Additional problems that result in excessive pedal travel include bent shoes or linings and rear brakes that have not been adjusted.

There is nothing to say that the pedal travel problem can't be reversed with too little travel. If this happens the compensating port might be plugged or the master cylinder cup swollen. Decreasing pedal travel also occurs when the master cylinder piston doesn't return or a wheel cylinder piston sticks. Weak shoe retracting springs will produce the same effect.

Regardless of the symptom — a pedal that depresses farther than usual, a pedal that sinks to the floor when you're stopped at a light, a pedal that needs pumping to stop the car — the brakes need immediate attention when you feel something unusual.

You should also pay attention to the brake light on your car's instrument panel. If it flashes on, you must get the system checked as soon as possible. Any driving after the light comes on must be done with caution.

Whatever the signal you receive — noise, feel, light — don't put off getting an inspection and needed repairs or you

continued

And then pull out the inner wheel bearing.

Carefully clean all the old grease from the bearing surfaces.

(left)
Also clean the old grease from the rotor races.

(above)
Auto hobby shop personnel are always willing to show how something should be done.

(right)
Torque the nut to specification

could damage expensive components of the system.

Even if you don't notice anything out of the ordinary, you should check your brakes annually, or at least every 10,000 miles. Wear develops so gradually that it can be hard to detect.

Also, check the master cylinder brake fluid level monthly. If the brake fluid is low, inspect the brakes.

Brakes work by fluid pressure pushing pistons in the calipers and wheel cylinders. A well-functioning system doesn't lose fluid. The level may go down because of wear, but it shouldn't fall below the "minimum" level mark on the master cylinder.

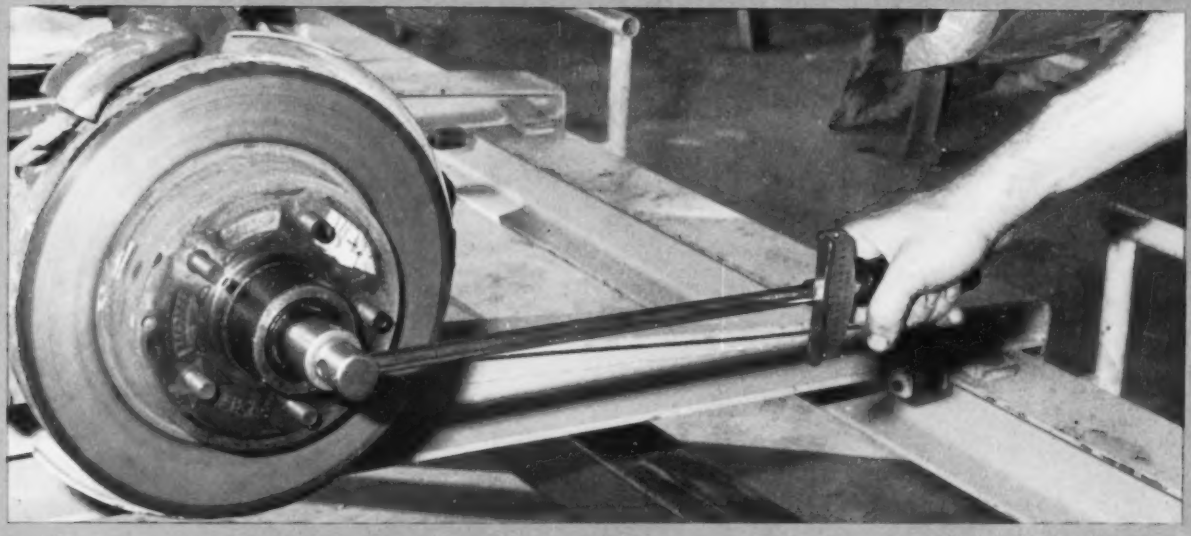
An inspection begins with a test drive. That's when you or the technician performing the inspection checks for brake noises, pedal travel and brake pulls. Next you check for low brake fluid level indicating leaks in the cylinders, brake lines or hoses.

The wheels are going to have to come off next so the shoe and pad linings can be checked for uneven wear, glazing or saturation from brake fluid. Now measure the friction material thickness. If it is less than ⅛-inch the pads or shoes must

Carefully work new grease into the bearing.

Reinstall the inner bearing with a new grease seal.

With the rotor and outer bearing in position, relocate the wheel nut.



be replaced.

The caliper pistons and wheel cylinder must also be checked for signs of leaks that could saturate linings with fluid or frozen pistons that might mean inoperative brakes. The drums and rotors have to be measured for excessive wear (the specifications are usually marked on the drum or rotor surface) and inspected.

Then look over the parking brake to make sure it's adjusted properly and not frozen.

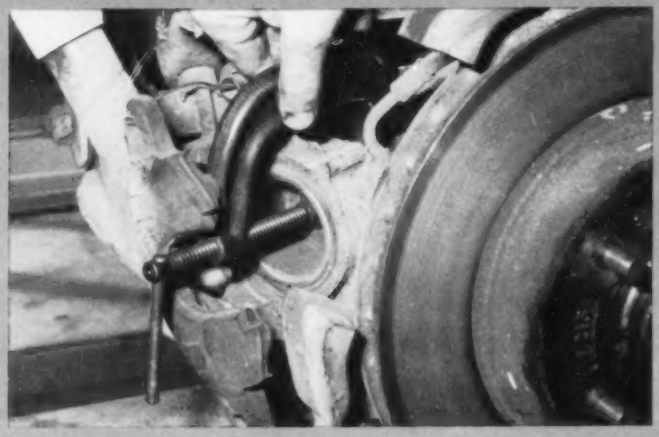
To do a quality brake repair job you should replace worn or defective components with parts equal to or better than the car's original equipment.

For example, if the manufacturer originally used semi-metal linings, don't install shoes or pads using regular materials. Semi-metallics are specifically designed for heavy duty applications and original equipment on downsized cars. This is because they will wear longer, resist higher operating temperatures, reduce noise and possible rotor damage.

Often a mechanic will recommend overhauling the hydraulic system. In the long run this will save you money because hydraulic components do fail after

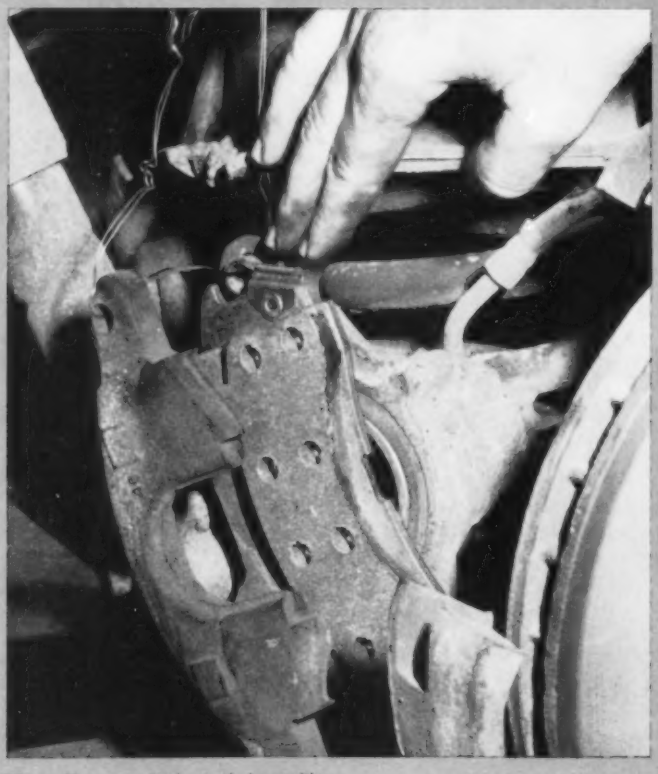
continued

And install a new cotter pin.



Compress the piston to bottom of its bore.

Be sure to clean any grease off the rotor.



Place the new brake pads in position.

a period of time because of contaminated brake fluid and corrosion.

To be done properly, the calipers should be overhauled and the rotors resurfaced before the shoe and pad linings are replaced. To do this, the calipers that hold the disc brake pads must be disassembled and cleaned. Then install new seals and replace the brake hardware.

Remove the rotors. While you're at it inspect and repack the wheel bearings with fresh grease. Be sure to install new seals.

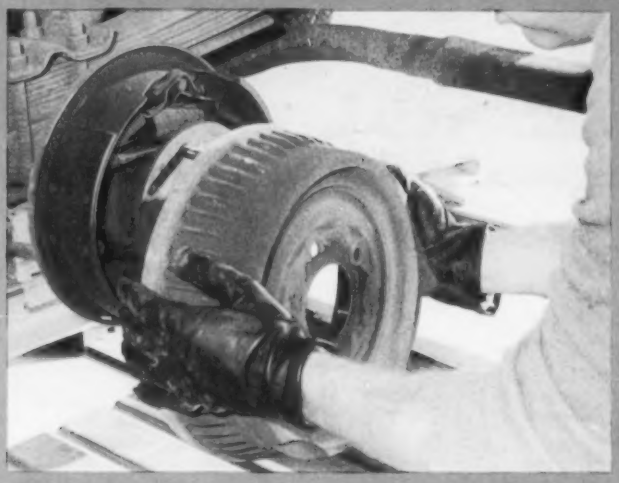
Now machine the rotors to remove any glazing and smooth out any uneven surface wear. Then reinstall the rotors with the repacked bearings and retorque the nut to the manufacturer's specifications.

The new brake pad linings can now be installed on each side of the calipers and then assembled on the rotors.

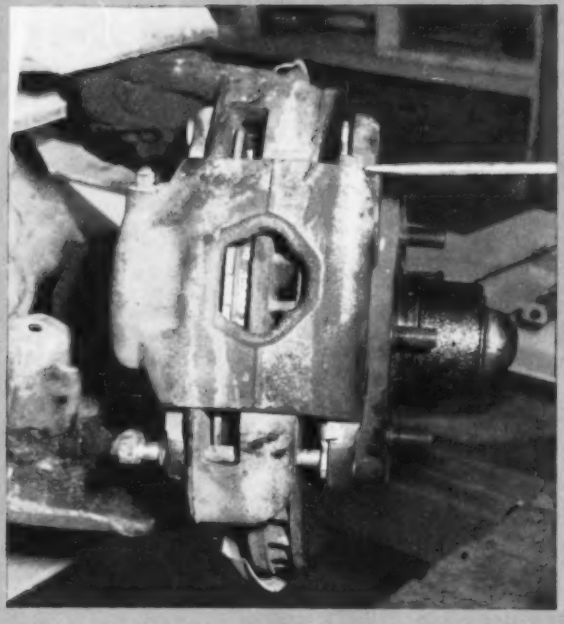
At the rear, once the drums are removed they should be machined to specifications. This will assure a smooth, round seating surface. With the drums off, the assembly — including wheel cylinder — can be disassembled. After an inspection the wheel cylinders can be rebuilt or new units installed as needed.

Check the mounting plate and parking

And relocate the caliper over the rotor.



With the rear wheel removed, the brake drum should easily slip off (make sure the parking brake *isn't* on) for a quick inspection.



Be sure to double check all work against the opposite brake assembly and make sure that everything is tight. Remember, only do one unit at a time so that you have an already assembled unit to check against.

Because there is more than ⅛-inch of friction material left on the shoes, you can leave these rear brakes until the next check up in 5,000 miles.

brake mechanism next. Finally, install the new shoes with new hardware. Then adjust the rear linings.

To complete a quality brake job, pressure bleed the entire hydraulic system with new, clean brake fluid. This will remove any moisture and air that is present.

Even though the work is done, your brake job is not finished. You should pamper your brakes for at least the first 100 or so miles by driving smoothly. This will keep you from glazing the surfaces. Avoid quick stops that create excessive friction and wear out the brakes.

Actually, you should brake as smoothly as possible at all times. In fact, you can usually tell what kind of fuel mileage a driver is getting by watching how they brake. Those who seldom use the brake and then only lightly, usually get better fuel economy than other drivers. Simply stated: Using the brakes means that some fuel energy has been wasted to create speed that has to be scrubbed off.

But most of all, don't forget to listen and feel for signs of trouble.

Backfire LETTERS TO THE EDITORS

LIP SERVICE

Your magazine continues to be a leader in attempting to educate members in the benefits of seat belt usage. Your articles clearly educate, advocate and motivate. Nevertheless, the services and individual installations continue to undermine your efforts through the "convenient" lack of enforcement of DOD seat belt policy.

Gate sentries and several base chiefs of police have used "convenient" excuses for their lack of enforcement: "We are understaffed;" "It makes people angry to be delayed;" "It would back up rush-hour traffic too much;" "I didn't know it was a DOD requirement." The litany of excuses goes on and on.

The sad fact is that until bases begin enforcing this long extant policy, people will continue to ignore one of the best safety features ever devised in automobiles, and suffer the results.

It appalls me to see such blatant disregard for DOD policy. Lip service only saves lives during CPR.

Lt. Col. Peter K. Christensen, USAF
Springfield VA 22153

OPEN LETTER TO LOCAL STATE AND FEDERAL HIGHWAY SAFETY OFFICIALS

I have been a student of motorcycle safety since the early 1960's. As such, I want to make you aware of the following traffic safety problem.

Several days ago I took a day off from work and my daughter and I drove my 1984 Harley Davidson motorcycle to Winchester, Va. It is always a beautiful drive and this day was exceptionally nice. After a day of sight seeing we returned to Alexandria, Va., via State Route 66. It grew quite dark and just outside Manassas, Va., we encountered a very dangerous situation. The highway had been stripped of its surface. The strips were approximately 100 yards long, six inches deep, and grooved and uneven on the bottom. Both east bound lanes were torn-up in this manner and the debris was piled on the shoulders of the road. When we hit the first of these strips I had very little control over the bike. There were signs posted warning of the conditions ahead, but nothing to reflect the completely unsafe nature of the road for motorcycle traffic. Please remember that is was very dark, speed approximately 55 MPH and my only child on the rear of the motorcycle. The road was torn into strips like this for approximately three miles. When we finally arrived at the Manassas exit we found another strip, and thus to exit route 66 you had to force the front tire of the motorcycle over a four to six inch concrete lip. In the best of conditions, this is tough and dangerous. Given the above situation, it was terrifying. After it was all over, my daughter was in a state of shock and I was both physically and mentally exhausted.

The point I want to make here is this: What is an adequate danger warning for an automobile or truck is probably not an adequate warning for a motorcycle. For example, in the above example flashing lights and a sign saying "Grooved Pavement Ahead" were displayed. This is satisfactory for a 1981 Chevy but for a motorcycle the warning is not adequate. Specifically in the above example signs should have said — "Grooved Pavement Ahead — Dangerous for Trucks and Autos — Not Passable for Motorcycles Traveling over 20 MPH" — or words to that effect. Nothing else will do. With the number of citizens that ride motorcycles for recreation and for every day transportation, the safety for *all* vehicles must be considered. Further, if a few more signs and lights save a human life, then that effort and cost is well spent.

By the way, the highway in question is now repaved, but the same type of hazardous construction can be found throughout Northern Virginia. Your understanding, professionalism, and cooperation is appreciated.

Maj. Duane Van Fleet, Jr., USMC
Alexandria VA 22310

PROBLEM IS WITH MULTI-VEHICLE DRIVER

I agree with what was written in "Too Much of a Good Thing" in the October issue. While complex controls in an auto do increase the time needed for driver familiarization, this is not the key problem. The problem is with the multi-vehicle driver. The time needed for familiarization is short and one time. Most people who drive a government vehicle also drive a personal vehicle. If that person is in a two-car family then three different sets of controls must be dealt with often on a daily basis. In my case I have a personal vehicle and a company vehicle with standard transmissions but the military vehicles I drive have automatic transmissions. The result is that I find myself clutching occasionally when driving my military car. This is a harmless example to a problem which does not have a solution.

TSgt. Kenneth Peters, USAFR
Portland OR 97229

Some of us who've been around the Air Force a long time have heard a lot of talk about cockpit standardization in aircraft. The same arguments apply to our autos. But you're right. Putting the same control in the same place and having it work in the same way will never happen.

SOME FEATS NOT POSSIBLE

I've never written a letter to the editor before because I've never read anything that stirred me inside enough to write one. I've always hoped that if I were to write one, it would be to compliment someone on a well written article or something. Unfortunately, this is not the case.

As an avid motorcycle enthusiast, I am forced to comment on both CMDR Brooks (letters to the editor, Oct 85) and SSgt. Zenda's (July 85) letters.

Both letters make their points crystal clear. True, it is very unfortunate that people are dying in automobile and motorcycle accidents. However, what both CMDR Brooks and SSgt. Zenda fail to understand is the fact that cars and motorcycles are not dangerous or unsafe. The people that operate them are. At least, some of the people.

The attitudes expressed by these individuals lead me to believe that they (along with other people who think like they do) may be involved in an accident involving a motorcycle, they probably will be the cause of the accident and their excuse (I'm sure this has never been

used) will be "I never saw the motorcycle."

Furthermore, these attitudes also tell me that these people think they are 100% aware of what's going on around them every minute they drive down the road. I hardly think so.

As an experienced motorcyclist, 8 years, I think about what I should look for concerning motorcycles as I drive my car. To this day, I still get surprised.

Although I do have a car, I use my motorcycle for 99% of my transportation needs, no matter what the weather, for one reason. I enjoy it! I just dress for the occasion and I keep my motorcycle well maintained.

I have some friendly advice for CMDR Brooks and SSgt. Zenda. They ought to spend a little time on a motorcycle, a week will do, because if I am forced to listen to critics, I would at least like to listen to an experienced critic instead of someone who is just criticizing because they have nothing better to do than harass people who get enjoyment from a sport.

Or, if they won't ride for a week, have them go for one ride, even if it's as a passenger and let them watch the traffic around them. This way, they will see what they look like from our point of view.

I, for one, think that *everyone* should have to ride a motorcycle before they are issued a drivers license for their cars. That way, they would have to learn a little compassion for cyclists.

Of course, in the case of CMDR Brooks and SSgt. Zenda, some feats simply are not possible!

SSgt. Steve Brandon, USAF
Laughlin AFB TX 78840

CARBOXYHEMOGLOBIN

The staffer who wrote "The Drug Primer" in your November 85 edition deserves praise for work well done! It is one of the best articles on this topic I've seen in a lay publication!

With our population's almost obsessive desire to take a drug for everything (something to wake up, something to go to sleep, something to "cure" a cold, something to diet with, etc.), most people are terribly complacent about the effects of drugs on their performance. As a specialist in emergency medicine, I can assure you that most of the "accidents" which result in injury or death have chemicals as a contributing cause. While alcohol is the most common, antihistamines and other chemicals are also common (and often-overlooked) factors.

I would like to call your attention to one important drug which your writer overlooked, however. With the background level of carbon monoxide resulting from normal traffic on busy highways, there's always a low level of carboxyhemoglobin found in rush hour drivers. It's usually two to three percent . . . not enough to cause serious degradation of performance. But a tobacco smoker adds to this, and can even have carboxyhemoglobin levels as high as six to ten percent. This results in literal hypoxia . . . something flyers are keenly aware of. A drop in the available oxygen by 10 percent may cause only moderate performance degradation in daylight hours, but can decrease night vision dramatically! If you add in fatigue, stress, and other chemicals, the effects are even more pronounced. (Another subtle form of suicide associated with tobacco use, along with pulmonary disease, cancer, and cardiovascular disease!)

Your magazine is almost always worth reading from cover to cover! That's a truly exceptional accomplishment among publications today! Keep up the good work!

Col. Cary D. Hardison,
USAF, MC, FS
Wurtsmith AFB MI 48753-5300

MOTORCYCLES NEITHER GOOD NOR BAD

I just had the chance to read your July 85 and October 85 issues and I must comment on "In Favor of Motorcycles" by MSgt. Petron and Cmdr. Brooks' reply.

While it is impractical to drive a motorcycle every day of the year due to weather, motorcycle driving/riding does reduce some of the traffic congestion our country faces. Unfortunately, too few licensed drivers have been educated in motorcycle handling and safe operation.

In countries where autos are less prevalent than cycles, there are also fewer cycle accidents. Is this due to better education of drivers or just an awareness of OTHER drivers? I have seen in this country where cyclists have seriously tempted an accident by showing off or just not following good common sense. Conversely, I have also been pushed off the road by other vehicles, and, in one incident, had a gun aimed at me by a passing car (the holder told me to "get the f--- off the road!").

Motorcycles are neither good nor bad in themselves. The problem is in education of all motorists to be aware of one another and to use common sense.

To MSgt. Petron, I must say that his article was very well done. Referencing Cmdr. Brooks' letter, I regret the unfortunate circumstances which have happened to his crew. All I can do is offer my condolences and ask respectfully, "Would you ban planes, water surface craft, or submarines?"

SrA Bruce W. Franke
King Salmon AFS AK 98713

NEVER HIT A BOX

You may have already received a similar experience but I felt it worth telling on the chance it has not been told before.

As a young child (I think about eight years old), I was with my father on an errand in the car. We were driving in a residential area and a ways in front of us was a cardboard in the middle of our traffic lane. As we approached it my father said "Never hit boxes in the street. You never know what's in them." As we went around the box, I turned to look at it out of the window and a child about my own age crawled from inside the box. I have never forgotten the scene nor have I ever hit a box.

Col Robert R. Ronish, USAR
Bisbee AZ 85603-9706

Your father passed on some good advice that should be widely circulated. There may not often be a child hidden in the box but there may be things that damage tires or cause your car to change direction.

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**"The belts are buckling
For me and my gal,
"Though folks are chuckling
At me and my gal..."**